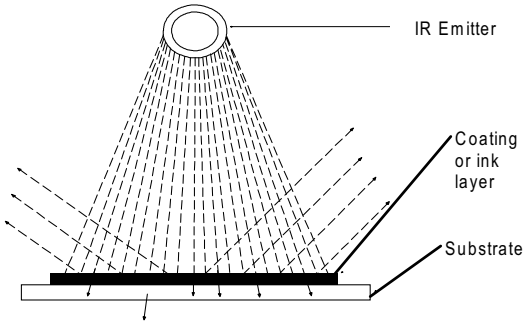
Applied Technology: Infrared



Source: EPRI TechCommentary V3, N6R, 1994

Concept

Infrared heating is produced by electromagnetic radiation generated from a heat source that typically operates in the range of 425 C° (800 F°) to 2200 C° (4000 F°). It is similar to the heat on an object directly exposed to the sun. Infrared is actually an extension of electric resistance heating since the electric IR emitters are heated by passing a current through a heating element. The elements may be in glass bulbs, quartz or metallic tubes, or in ceramic panels. IR is classified by its wavelength:

Type	Emitter Temperature C° (F°)	Wavelength range, microns
long wave	450 - 750 (800 - 1400)	10 - 4
medium wave	750 - 1100 (1400 - 2000)	4 - 2
short wave	1100 - 2200 (2000 - 4000)	< 2

Applications

- Surface Heating
- Preheating
- Space Heating
- Curing
- Foundry Sand Reclamation
- Food Cooking and Browning
- Drying and Evaporation
- Heat Treating

Technologies Replaced

- Convection Ovens
- Air Drying
- Salt/Lead Bath Heat Treating
- Gas IR
- Steam Drying

Wastes Reduced

- Combustion Pollutants; ROG, SO_X, NO_X, CO_X, Particulate
- Salt/Lead Bath; hazardous salts/metals
- VOC's from solvents (with powder coatings)

Potential in Manufacturing

Indust	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*	*Indust*	*SIC*	*Pot*
Food	20	MED	Lumber	24	MED	Chem	28	MED	**Stone**	**32**	**HI**	**Elect**	**36**	**HI**
Tobac	21	MED	Furn	25	MED	Petrol	29	MED	Pmetal	33	MED	**Transp**	**37**	**HI**
Textile	**22**	**HI**	**Paper**	**26**	**HI**	**Rubber**	**30**	**HI**	**MetFab**	**34**	**HI**	**Instr**	**38**	**HI**
Apparel	23	MED	**Printing**	**27**	**HI**	Leather	31	MED	**Mach**	**35**	**HI**	**Misc**	**39**	**HI**

Credits: **George Bobart, Bobart Associates; Unimar Group, Ltd; The Electrification Council; Electric Power Research Institute**

Infrared ***continued***

Technology Advantages

- Fast
- Rapid Startup
- Precise Temperature Control

Enclosure not Required

Technology Disadvantages

- Requires Line of Sight
- Reflective Coatings are Difficult
- Maintenance of IR Emitters Higher in a Dirty Environment

Typical Costs

Capital Costs	O & M Costs	Potential Payback
low to moderate: $10k - $500K depending on application and size	low maintenance primarily emitter cleaning and replacement, operating costs low due to high efficiency	1 - 2 years

Installations

Case A - A company cured the coating on an architectural column with a gas fired oven in 1.5 hours using 8,000 ft^2 of floor space. They also experience environmental compliance problems with their emissions. The gas fired oven solvent based coating process was replaced with a short wave powder coating process. The new process only required 210 ft^2, cured in 34 seconds, increased production capability from 300 to 10,000 parts/shift, and met full environmental compliance.

Case B - A steel building components manufacturer bought strip precoated with a plastic protective finish. The strips were formed into specific panel sizes at their facility. They experienced high levels of inventory, scrap, and could not meet many of the color requirements of their customers. The installation of a 32 foot medium wavelength IR unit and powder coat system reduced their inventory and labor requirements by 50%, reduced their scrap generation from 30% to less than 10%, increased available product colors for their customers from 12 to 300, and kept them in full environmental compliance.

Major Vendors

Infrared

BGK Finishing Systems
4131 Pheasant Ridge Drive North
Blaine, MN 55449-7102
(612) 784-0466

Casso-Solar Corp
230 US Route 202
Pomona, NY 01970
(914) 354-2500

Fostoria Industries Inc
Process Heat Division
P.O. Box E
Fostoria, OH 44830
(419) 435-9201

Industrial Heating and Finishing Co., Inc.
P.O. Box 129
Pelham Industrial Park
Pelham, AL 35124
(205) 663-9595

Lindberg
304 Hart Street
Watertown, WI 53094
(414) 261-7000

Rapid Engineering, Inc.
P.O. Box 700
Comstock Park, MI 49321-0700
(616) 784-0435

Research, Inc.
P.O. Box 24064
Minneapolis, MN 55424
(612) 941-3300

Thermal Designs & Mfg. Inc.
16043 23 Mile
Macomb TWP, MI 48045
(810) 786-0164

This list of vendors of the indicated technology is not meant to be a complete or comprehensive listing. Mention of any product, process, service, or vendor in this publication is solely for educational purposes and should not be regarded as an endorsement by the authors or publishers.

Index to EPRI DOCUMENTS

Infrared

Infrared Processing of Coatings, EPRI CMF TechCommentary, Vol 3, No 6R, 1994

Infrared Drying in Papermaking, EPRI PIO TechCommentary, Vol 2, No 1, 1989

Medium & Short Wave Infrared Curing, EPRI CMF TechApplication, Vol 1, No 3, 1987

Short Wave Infrared Curing, EPRI CMF TechApplication, Vol 1, No 1, 1991

Infrared Drying of Paint, EPRI CMF TechApplication, Vol 3, No 1, 1991

Infrared Drying of Anodized Aluminum , EPRI CMF TechApplication, Vol 7, No 4, 1994

Infrared Curing for Spot Repair of Auto Paint Surfaces, EPRI CMF TechApplication, Vol 8, No 3, 1994

Infrared Heating, Drying, and Curing, EPRI CMF TechCommentary, Vol 8, No 1, 1992

Infrared Curing of Powdered Coatings, EPRI CMF TechApplication, Vol 4, No 1, 1990

Infrared Drying of Inks, EPRI CMF TechApplication, Vol 6, No 3, 1992

Infrared Curing of Silk Screen Apparel, EPRI CMF TechApplication, Vol 7, No 3, 1993

Using Electric IR to Finish Oil Filters, EPRI CMF TechApplication, Vol 7, No 2, 1987

Infrared Drying of Automotive Seat Risers, EPRI CMF TechApplication, Vol 8, No 1, 1994

Powder Coated Castings Achieve Cure With Electric IR, EPRI CMF TechApplication, Vol 8, No 4, 1994

Infrared-Assisted Drying of Foundry Mold Wash Coatings, EPRI CMP TechApplication, CMP-091, 1994

IR Moisture Profiling of Linerboard, EPRI PIO TechApplication, Vol 4, No 7, 1992

Electric Infrared Boarding of Hosiery, EPRI PIO TechApplication, Vol 5, No 1, 1993

Electric IR Curing of Textile Resin Finishes, EPRI PIO TechApplication, Vol 6, No 3, 1994

Electric Infrared Treatment Speeds Coating Process, EPRI TechApplication, TA-105128, 1996

Infrared Curing of Coatings on Heavy Parts, EPRI TechApplication, TA-106310, 1996

Electric Infrared Predrying of Terry Fabric, EPRI TechApplication, TA-107253, 1996

Electric Infrared Predrying of Finished Fabrics, EPRI TechApplication, TA-107183, 1996

Drying Aircraft Parts Using Electric Infrared, EPRI TechApplication, TA-106792, 1996

This information is designed to help you determine **potential** applications for the technology. You are encouraged to contact one of the listed vendors or a consultant for details and pricing.

This manual is not intended as a recommendation of any particular technology, process, or method. Mention of trade names, vendors, or commercial products do not constitute endorsement or recommendation for use. It is offered for educational and informational purposes and is advisory only.

For reprints write to:
TVA Economic Development
400 West Summit Hill Drive
Knoxville, TN 37902-1499

E-Mail:
sjhillenbrand@tva.gov

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